Draft

Visible, Infrared, and Multispectral Airborne Sensor Support Data Extensions (SDE)

for the

National Imagery Transmission Format (Version 2.0)

of the

National Imagery Transmission Format Standards

27 April 1997

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1. SCOPE

1.1. Scope.

This appendix specifies the format and content of a set of controlled tagged record extensions for the National Imagery Transmission Format (NITF v2.0) file format. The specified tagged records incorporate all Support Data Extensions (SDE) relevant to visible and infrared (EO-IR) primary imagery -- the intent is to also accommodate multispectral and hyperspectral imagery, but they are not yet explicitly included. The information which makes up the SDE is derived from referenced interface documents. Systems using visible, or infrared imagery formatted according to NITF 2.0 from airborne sensors should be designed to extract the needed data from the tagged records described herein.

1.2. Content.

This appendix provides a detailed description of the overall structure, as well as specification of the valid data content and format, for all fields defined within each specified SDE. In addition, technical information is presented to provide a general understanding of the significance of the included fields.

1.3. Applicability.

The applicability of this appendix is inherited from the NITF 2.0 standard. It is applicable to all Department of Defense new equipment and systems, and those undergoing major modification, having a requirement to support airborne EO-IR and multispectral imagery. These systems shall conform to the NITF 2.0 standard, including the SDEs described in this appendix.

1.4. Certification.

Pertinent compliance requirements are defined in Joint Interoperability Engineering Organization (JIEO) Circular 9008, National Imagery Transmission Format Certification Test and Evaluation Plan.

2. APPLICABLE DOCUMENTS

2.1. Government documents

2.1.1. Specifications, standards and handbooks.

The following standards form a part of this document to the extent specified. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS).

MILITARY STANDARDS

MIL-STD-2500A	National Imagery Transmission Format (NITF) for the National Imagery Transmission Format Standards (NITFS), 12 October 1994.

(Copies of the above NITFS document may be obtained from DODSSP, Subscription Services Desk, 700 Robins Avenue, Bldg. 4D, Philadelphia, PA 19111-5094, telephone (215) 697-2569)

MILITARY HANDBOOKS

MIL-HDBK-1300	National Imagery Transmission Format Standard (NITFS) Handbook, 30 June 1993.

(Copies of the above NITFS document may be obtained from DODSSP, Subscription Services Desk, 700 Robins Avenue, Bldg. 4D, Philadelphia, PA 19111-5094, telephone (215) 697-2569)

2.1.2. Other Government documents, drawings, and publications;.

The following other Government documents form a part of this document to the extent specified. Unless otherwise specified, the issues of these documents are those cited in the solicitation.

DISA/JIEO Circular 9008	NITFS Certification Test and Evaluation Program Plan

(Copies of the above NITFS document may be obtained from Joint Interoperability Test Center, Attn: TCDBA, Bldg. 57305, Ft, Huachuca, AZ 85613-7020, telephone (520) 538-5154.)

DIAM-65-3-1	Standard Coding Systems Functional Classification Handbook, Defense Intelligence Agency, July 1995
RASG-9606-001	Airborne Synthetic Aperture Radar Support Data Extensions for the National Imagery Transmission Format, 20 May 1996
CIO-2047	Support Data Extensions (version 1.1) for the National Imagery Transmission Format (Version 2.0) of the National Imagery Transmission Format Standard (TS) 15 April 1995

2.1.3. Non-Government publications.

The following documents form a part of this document to the extent specified. Unless otherwise specified, the issues of the documents that are adopted by the DoD are those listed in the issue of the DODISS cited in the solicitation.

NATIONAL STANDARDS

ANSI X3.4 - 1986	American National Standard Code for Information Interchange (ASCII), 1986.

(Copies of the above document are available from American National Standards Institute (ANSI) Sales Department, 1430 Broadway, New York, NY 10018, telephone: (212) 642-4900.)

3. DEFINITIONS

3.1. Acronyms

Field Names and Values contained in the various tables of this document are not replicated in this list.

A/C	Aircraft
ANSI	American National Standards Institute
ASCII	American National Standard Code for Information Interchange
BE	Basic Encyclopedia
CCRP	Collection Central reference Point
DODIIS	Department of Defense Intelligence Information System
ECF	Earth Centered Fixed Coordinate System
EMTI	Enhanced Moving Target Information
EO	Electro-Optical
GMT	Greenwich Mean Time
ID	Identification
INS	Inertial Navigation System
IR	infrared
JIEO	Joint Interoperability Engineering Organization
MSL	Mean Sea Level
NED	North East Down Coordinate System
NITF	National Imagery Transmission Format
NITFS	National Imagery Transmission Format Standards
SAR	Synthetic Aperture Radar
SDE	Support Data Extension
TBD	To Be Determined
WAMTI	Wide-Area Moving Target Information
WDG	Wideband Data Group

4. GENERAL REQUIREMENTS

4.1. Support Data Extensions (SDEs).

Support data is that information needed to interpret or disseminate associated sensor data and includes mission, platform and sensor dynamic, and sensor static information. That set of support data needed to accomplish the mission of a system receiving a NITF 2.0 file is referred to as "appropriate" support data. The appropriate support data may vary across systems receiving NITF 2.0 files. A system receiving a NITF 2.0 file may add or subtract support data before passing the file to another system with a different mission. This strategy implies a modular support data definition approach.

4.1.1. Sources of support data.

Sensors collecting imagery also collect and report auxiliary data that uniquely identifies the imagery, defines the collection geometry, and contains other information to aid exploitation of that imagery. The extensions described here define the format for that support information within a NITF 2.0 file containing visible or infrared imagery.

4.1.2. Specification Change Impacts

Imagery providers generating these SDEs may continue to generate them even if the sensors change; this allows commercial systems to base their software on the SDEs. Revisions to these NITF Extensions, or to the NITF itself, will have associated transition plans to accommodate existing users.

4.1.3. Defined Support Data Extensions.

Table 1 lists all of the support data extensions described in this document, and whether they are required for all airborne imagery. They are defined for use with visible, infrared (EO-IR) and multispectral imagery collected on airborne sensor platforms. Several are similar to existing and proposed extensions developed by other programs and sensors, including airborne Synthetic Aperture Radar (SAR), and can be considered aliases to those extensions. Where original fields are not applicable to airborne EO-IR imagery, *reserved* data fields maintain

Table 1. Airborne Visible, Infrared, and Multispectral Support Data Extensions.

Tag	Title	Requirement
AIMID	Additional Image Identification	Required
ACFT	Aircraft Information	Required
BANDS	Multispectral Band Parameters	Optional
BLOCK	Image Block Information	Required
EXOPT	Exploitation Usability Optical Information	Optional
MPDEO	EO-IR Mensuration Data	Optional
MSTGT	Mission Target	Optional
RPOS0	Rapid Positioning Data	Optional
SECTG	Secondary Targeting Info	Optional
SENSR	EO-IR Sensor Parameters	Required
STERO	Stereo Information	Optional

alignment between the original and alias extensions. Extensions defined for airborne SAR sensors that are applicable to EO-IR sensors are shaded in Table 1 and are shown in this document only for reference.

Each tag ends with a revision letter; the initial definition will use the revision letter “A”. Revised tags will have names ending in “B” (“C”,”D”, etc.) as revisions are approved. A transition plan for implementing tag changes shall accompany any such revisions (typically, for a period of time, both the “A” and “B” versions should be supported for receivers of NITF products). SDE fields affected by version changes can contain ASCII blanks (hex 20) for transitioning between the versions.

The section which describes the purpose of an extension is titled without the revision letter, such that if the extension were to change, the purpose paragraph would not require changing. For example, section 5.3 describes the ACFT or Aircraft Information extension. The actual tag, however, is ACFTA. If in the future, a change is made, section 5.3 will continue to describe the ACFT or Aircraft Information extensions, but would include a definition of both the ACFTA and ACFTB tagged extensions.

4.2. Technical Notes on Coordinate Systems

4.2.1. Locations

Figure 1 shows the earth coordinate frame, the local North-East-Down (NED) coordinate frame, and the platform location parameters: latitude and longitude. The platform location parameters define the location in earth coordinates of the sensor platform, or more specifically, the platform center of navigation. The center of navigation is the origin of the local NED coordinate frame. The local NED coordinates are North N, East E, and Down D as shown.

The location of the center of navigation within the platform is not relevant because platform dimensions are small relative to the positional errors in the support data.

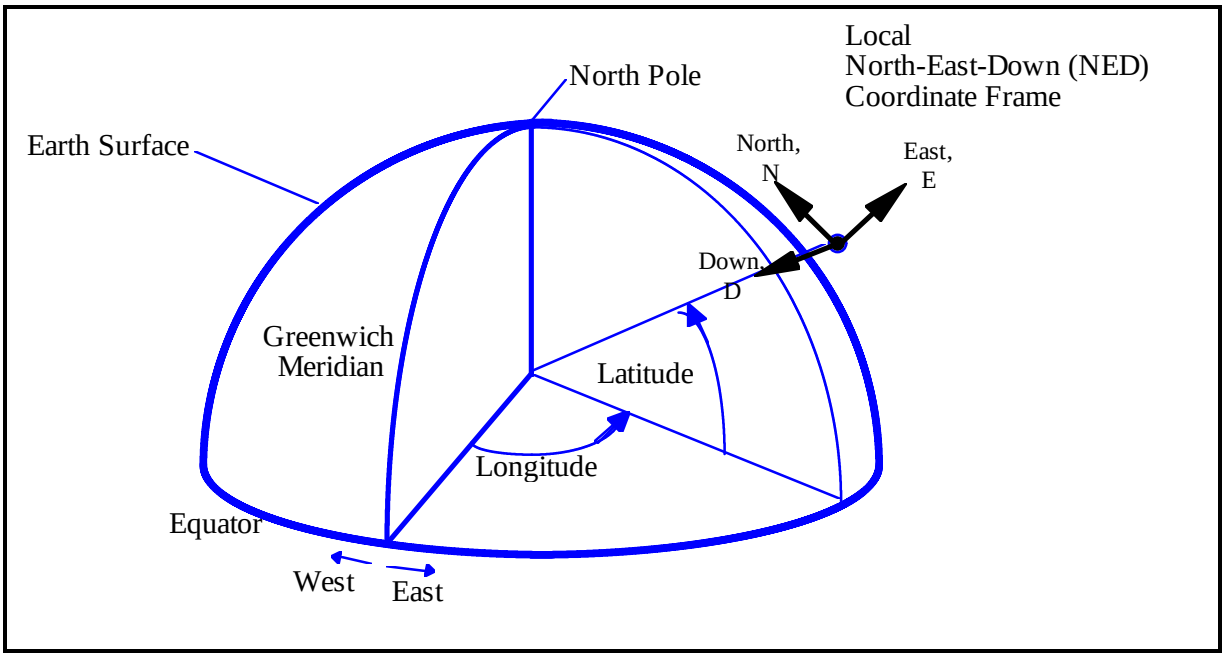

Figure 1 Platform Location Coordinates

The earth surface in Figure 1 is described in the World Geodetic System of 1984 (WGS-84) as two different model surfaces. The two surfaces are an ellipsoid and a geoid (see Figure 2). The ellipsoid is an ideal mathematical surface; the geoid is the mean-sea-level surface of the earth as determined by gravitational potential (elevation of the geoid relative to the ellipsoid varies with location from -102 to +74 meters). Platform latitude and longitude are referenced to the ellipsoid, while platform altitude MSL is defined with respect to the geoid: Altitude MSL is the vertical distance from mean sea level to the platform.

The Down-axis (D) of the NED coordinate frame lies normal to the geoid. That is, D lies in the direction of gravitational acceleration. The North-axis (N) and East-axis (E) lie in the geometric plane perpendicular to D (the horizontal plane), with N in the direction of True North.

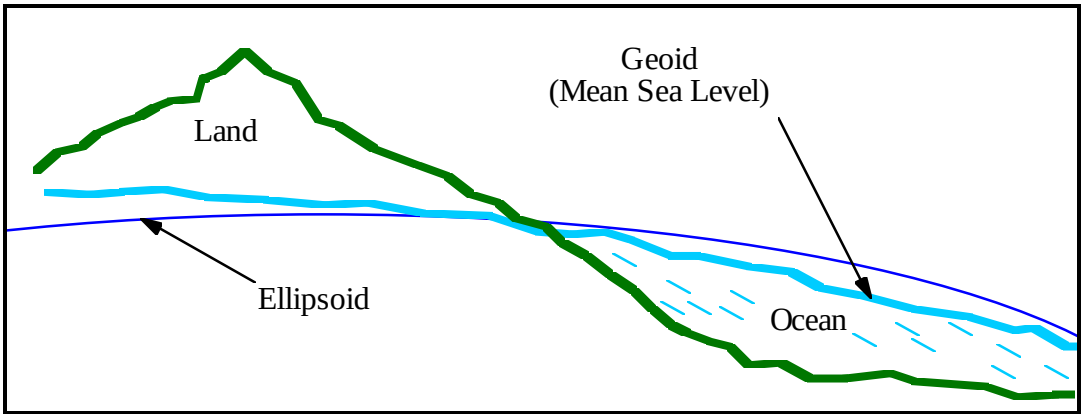

Figure 2 Ellipsoid and Geoid Models of the Earth Surface

5. DETAILED REQUIREMENTS

5.1. Generic Tagged Extension Mechanism

The tagged record extensions defined in this document are "controlled tagged record extensions" as defined in Section 5.9 of MIL-STD-2500. The tagged record extension format is summarized here for ease of reference. Table 2 describes the general format of a controlled tagged record extension.

Table 2. Controlled Tagged Record Extension Format
(TYPE "R" = Required, "C" = Conditional, <> = null data allowed)

FIELD	NAME	SIZE	VALUE RANGE	UNITS	TYPE
CETAG	Unique extension type identifier, a valid alphanumeric identifier properly registered with the NITF Technical Board.	6	Alphanumeric	n/a	R
CEL	Length of CEDATA field. The length in bytes of the data contained in CEDATA. The tagged record's overall length is the value of CEL + 11.	5	00001 to 99985	Bytes	R
CEDATA	User-defined data. This field shall contain data primarily of character data type (binary data is acceptable for extensive data arrays, such as color palettes or look-up tables) defined by and formatted according to user specification. The length of this field shall not cause any other NITF field length limits to be exceeded but is otherwise fully user defined.	*	User-defined	n/a	R

* equal to value of CEL field.

The CETAG and CEL fields essentially form a small (11 byte) tagged record subheader. The format and meaning of the data within the CEDATA field is the subject of this document for several, individual controlled tagged record extensions.

Multiple tagged extensions can exist within the tagged record extension area. There are several such areas, each of which can contain 99,999 bytes worth of tagged extensions. There is also an overflow mechanism, should the sum of all tags in an area exceed 99,999 bytes. The overflow mechanism allows for up to 1 Gbyte of tags.

While the extensions defined in this document will typically be found in the image subheader, it is possible that they could appear in a Data Extension Segment which is being used as an overflow of the image subheader.

If the information contained within an extension is not available, the extension will not be present in the file. For example, if the image is not part of a stereo set, the STEROA extension will not be present. The set of extensions stored within the file can change over the lifetime of the image, due to additional information, removal of outdated information, or change in classification. Table 1 indicates which extensions must appear in every file and which may be omitted.

When an extension is present, all of the information listed as Required (type = “R”) must be filled in with valid information. Information listed as Conditional (type = “C”) may or may not be present, depending upon the value in a preceding field; conditional fields that are not present occupy no space in the file. Information identified with angle brackets (type = “<R>“ or “<C>“) may contain valid information, or may contain ASCII spaces (i.e., hex 20) to indicate a null field - that valid data is unavailable. Reserved fields support applications beyond the scope of this document, and normally contain spaces where no value is explicitly specified; however, other values are possible.

Alphanumeric values that do not fill the allotted space are left justified within a field, and the remaining bytes are filled with ASCII spaces (i.e., hex 20). Numeric values are right justified within the field, with ASCII zeros (i.e., hex 30) extending to the left field boundary.

5.2. Applicable Airborne SAR Extensions

The following extensions, extracted from *Airborne Synthetic Aperture Support Data Extensions, RASG 9606-001*, are also applicable to Visible, IR, and Multispectral imagery from airborne sensors. These extensions have been included in this document for completeness. Note that the value definitions and ranges of some fields have been extended from what appears in the above document.

5.2.1. AIMID — Additional Image ID

The Additional Image ID extension described below is identical to the AIMID defined in the Airborne SAR SDE document, and is included here for completeness. AIMID and is used for storage and retrieval from standard imagery libraries, and is a required component of all airborne imagery files. The format and description for the user defined fields of the AIMIDA extension are detailed in Table 3. A single AIMIDA is placed in the Image Subheader; where several images relate to a single scene, an AIMIDA may be placed in each applicable Image Subheader.

Table 3. AIMIDA — Additional Image ID Extension Format

(TYPE "R" = Required, "C" = Conditional, "<> = null data allowed)

FIELD	NAME	SIZE	VALUE RANGE	UNITS	TYPE
CETAG	Unique Extension Identifier	6	AIMIDA	n/a	R
CEL	Length of Entire Tagged Record	5	00073	Bytes	R
The following fields define AIMIDA					
MISSION_DATE	Aircraft T.O. Date. This field shall contain the date of the collection mission (date of aircraft takeoff) in the format YYYYMMDD, in which YYYY is the year, MM is the month (01–12), and DD is the day of the month (00-31). The date changes at midnight GMT.	8	YYYYMMDD		R
MISSION_IDENT	Mission Identification. Four character descriptor of the mission. Contents are user defined (for example, this may be the Project Code).	4	Alphanumeric		R
FLIGHT_NO	Flight Number. Each flight shall be identified by a flight number in the range 01 to 09. Flight 01 shall be the first flight of the day, flight 02 the second, etc. In order to ensure uniqueness in the image id, if the aircraft mission extends across midnight GMT, the flight number shall be 0x (where x is in the range 0 to 9) on images acquired before midnight GMT and Ax on images acquired after midnight GMT; for extended missions Bx, … Zx shall designate images acquired on subsequent days.	2	01 to 09, A1 to A9 B1 to B9 … Z1 to Z9		R
OP_NUM	Image Operation No. Reset to 001 at the start of each flight. A value of 000 indicates the airborne system does not number imaging operations.	3	000 to 999		<R>
	reserved	2	spaces		R

FIELD	NAME	SIZE	VALUE RANGE	UNITS	TYPE
REPRO_NUM	Reprocess Number. For SAR imagery this field indicates whether the data was reprocessed to overcome initial processing failures, or has been enhanced. A "00" in this field indicates that the data is an originally processed image, a range of "01" to "99" indicates the data is reprocessed. For visible and infrared imagery this field shall contain “00” to indicate no reprocessing.	2	00 to 99		R
REPLAY	Replay indicates whether the data was reprocessed to overcome initial processing failures, retransmitted to overcome transmission errors, or has been enhanced. A "000" in this field indicates that the data is an originally processed and transmitted image, a value in the range of "G01" to "P99" indicates the data is reprocessed, and a value in the range of “T01” to “T99” indicates it was retransmitted.	3	000, G01 to G99, P01 to P99, T01 to T99		<R>
	reserved	1	space		R
START_TILE_COLUMN	Starting Tile Column Number (cross scan direction).	3	001 to 999		R
START_TILE_ROW	Starting Tile Row Number (along scan direction).	5	00001 to 99999		R
	reserved	2	spaces		R
END_TILE_COLUMN	Ending column Tile No. (cross scan direction).	3	001 to 999		R
END_TILE_ROW	Ending row Tile No. (along scan direction).	5	00001 to 99999		R
COUNTRY	Country Code. Two letter code defining the country for the reference point of the image. Standard codes may be found in FIPS PUB 10-3. Default value, if data is not available, is spaces.	2	AA to ZZ, spaces		<R>
	reserved	4	spaces		R

FIELD	NAME	SIZE	VALUE RANGE	UNITS	TYPE
LOCATION	Location of the natural reference point of the sensor, provides a rough indication of geographic coverage. The format ddmmX represents degrees (00-89) and minutes (00-59) of latitude, with X = N or S for north or south, and dddmmY represents degrees (000-179) and minutes (00-59) of longitude, with Y = E or W for east or west, respectively.For SAR imagery the reference point is normally the center of the first image block.For EO-IR imagery the reference point for framing sensors is the center of the frame; for continuous sensors, it is the center of the first line.	11	YYYYMMDD		R
TIME	Collection Time, referenced to GMT, and accurate to 1 minute, of the image reference point in the format hhmmZ, in which hh is the hour (00-23), and mm is the minute (00-59); the final character "Z" is required.	5	hhmmZ		R
CRREATE_DATE	Date of First Line. The collection date of the image in the format YYYYMMDD, in which YYYY is the year, MM is the month (01–12), and DD is the day of the month (00-31). This date is coordinated with the collection time, i.e., the date changes at midnight GMT.	8	YYYYMMDD		R

5.2.2. ACFT — Aircraft Information

ACFT provides miscellaneous information unique to airborne sensors. The format and descriptions for the user defined fields of the ACFTA extension are detailed in Table 4. This Extension is required.

Table 4. ACFTA — Aircraft Information Extension Format
(TYPE "R" = Required, "C" = Conditional, <> = null data allowed)

FIELD	NAME	SIZE	VALUE RANGE	UNITS	TYPE
CETAG	Unique Extension Identifier	6	ACFTA	n/a	R
CEL	Length of Entire Tagged Record	5	00154	Bytes	R
The following fields define ACFTA					
AC_MSN_ID	Aircraft Mission Identification	10	Alphanumeric		R
AC_TAIL_NO	Aircraft Tail Number	10	Alphanumeric		<R>
SENSOR_ID	Sensor ID identifies which specific sensor produced the image. Examples: For Radar Imagery: ASARS-1 (Advanced SAR on SR-71) ASARS-2 (Advanced SAR on U-2) GHR (Global Hawk Radar) For EO-IR, the first four characters of Sensor ID are expressed as ccff where cc indicates the sensor category: IR VH (Visible High Altitude / Long Range VM (Visible Low Altitude) and ff indicates the sensor format: FR (Frame) LS (Line Scan) PB (Pushbroom) PS (Pan Scan)	10	Alphanumeric		R
SCENE_SOURCE	Scene Source indicates the origin of the request for the current scene. 0 = Pre-Planned 1-9 = Sensor Specific: For ASARS-2: 1 = Scene Update (uplink) 2 = Scene Update (manual - via pilot's cockpit display unit 3 = Immediate Scene (immediate spot or search range adjust) 5 = Preplanned Tape Modification 6 = SSS Other Sensors: TBD:	1	0 to 9		R
SCNUM	Scene Number identifies the current scene, and is determined from the mission plan; except for immediate scenes, where it may have the value 0, the scenes are numbered from 1. The scene number is only useful to replay/regenerate a specific scene; there is no relationship between the scene number and an exploitation requirement	6	000000 to 999999		R

FIELD	NAME	SIZE	VALUE RANGE	UNITS	TYPE
PDATE	Processing Date - For SAR, when the raw data is converted to imagery. For EO-IR, when image file is created. YYYY is the year, MM is the month (01–12), and DD is the day of the month (00-31). This date changes at midnight GMT.	8	YYYYMMDD		R
IMHOSTNO	Immediate Scene Host: Together with Immediate Scene Request Id below, denotes the scene that the immediate was initiated from and can be used to renumber the scene, Example: If the immediate scene was initiated from scene number 123 and this is the third request from that scene, then the scene number field will be zero, the immediate scene host field will contain 123 and the immediate scene request id will contain 3. Only valid for immediate scenes.	6	000000 to 000511		<R>
IMREQID	Immediate Scene Request Id	5	00000 to 32767		<R>
MPLAN	Mission Plan Mode defines the current collection mode. For ASARS-1: 001 - 005 = Search, submodes 1-5 006 - 010 = Op Spot, submodes 1-5 011 - 015 = Wideband Spot, submodes 1-5 For ASARS-2: 001 – Search 002 – Spot 3 004 – Spot 1 007 – Continuous Spot 3 008 – Continuous Spot 1 009 – EMTI Wide Frame Search 010 – EMTI Narrow Frame Search 011 – EMTI Augmented Spot 012 – EMTI Wide Area MTI (WAMTI) 013 – Monopulse Calibration For EO-IR: 001-003 – Reserved 004 – EO Spot 005 – EO Point Target 006 – EO Wide Area Search 014 – IR Spot 015 – IR Point Target 016 – IR Wide Area Search	3	001 to 016		R

FIELD	NAME	SIZE	VALUE RANGE	UNITS	TYPE
ENTLOC	Entry Location: In SAR Search mode and EO-IR Wide Area Search modes, the entry and exit locations are the specified latitude, longitude and altitude above mean sea level (MSL) of the planned entry and exit points on the scene centerline of the area to be imaged. In EO-IR and SAR Spot modes, and EO-IR Point Target modes, the entry location is the specified reference point latitude/longitude/altitude, and the exit location is not used. The format ddmmss.ccX represents degrees (00-89), minutes (00-59), seconds (00-59), and hundredths of seconds (00-99) of latitude, with X = N for north or S for south, and dddmmss.ccY represents degrees (000-179), minutes (00-59), seconds (00-59), and hundredths of seconds (00-99) of longitude, with Y = E for east or W for west.	21	ddmmss.ccXdddmmss.ccY		<R>
ENTALT	Entry Altitude	6	-01000 to +30000	ft.	<R>
EXITLOC	Exit Location	21	ddmmss.ccXdddmmss.ccY		<R>
EXITALT	Exit Altitude	6	-01000 to +30000	ft.	<R>

FIELD	NAME	SIZE	VALUE RANGE	UNITS	TYPE
TMAP	True Map Angle. For Radar Imagery: In Search modes, the true map angle is the angle between the ground projection of the line of sight from the aircraft and the scene center line. In Spot modes, the true map angle is the angle, measured at the central reference point, between the ground projection of the line of sight from the aircraft and a line parallel to the aircraft desired track heading. For EO-IR: The true map angle is defined in the NED coordinate system with origin at the aircraft (aircraft local NED), as the angle between the scene entry line of sight and the instantaneous aircraft track heading vector. The aircraft track heading vector is obtained by rotating the north unit vector of the aircraft local NED coordinate system in the aircraft local NE plane through the aircraft track heading angle. The true map angle is measured in the slanted plane containing the scene entry line of sight and the aircraft track heading vector. This angle is always positive.	7	000.000 to 180.000	degrees	<R>
ROW_SPACING	SAR: Ground plane distance between corresponding pixels of adjacent rows, measured in feet. EO-IR: Angle between corresponding pixels of adjacent rows, measured in microradians at center of image.	7	SAR: 00.0000 to 99.9999 EO-IR: 0000.00 to 9999.99	ft µ-radians	<R>
COL_SPACING	SAR: Ground plane distance between adjacent pixels within a row, measured in feet. EO-IR: Angle between adjacent pixels within a row, measured in microradians at center of image.	7	SAR: 00.0000 to 99.9999 EO-IR: 0000.00 to 9999.99	ft µ-radians	<R>
SENSERIAL	Sensor vendor's serial number of the line replaceable unit (LRU) containing EO-IR imaging electronics or SAR Receiver/Exciter involved in creating the imagery contained in this file.	6	000001 to 999999		<R>
ABSWVER	Version (vvvv) and revision (rr) numbers for the airborne software.	7	vvvv.rr		<R>
PATCH_TOT	Total Number of Patches contained in this file, and therefore the number of PATCH extensions.	4	SAR: Spot: 0000 to 0001 Search: 0001 to 0999 EO-IR: 0000		R

FIELD	NAME	SIZE	VALUE RANGE	UNITS	TYPE
MTI_TOT	Total Number of MTIRP extensions contained in this file. Each MTIRP identifies 1 to 256 moving targets. Shall be 000 for EO-IR imagery.	3	000 to 999		R

5.2.3. BLOCK — Image Block Information

Image Block Information supports exploitation and is required for exploitation of imagery. The format for the user defined fields of the BLOCKA extension and a description of their contents are detailed in Table 5. BLOCKA is placed in the Image Subheader; where several Image Subheaders relate to a single scene BLOCKA is placed in the first Image Subheader.

Table 5. BLOCKA — Image Block Information extension format
(TYPE "R" = Required, "C" = Conditional, <> = null data allowed)

FIELD	NAME	SIZE	VALUE RANGE	UNITS	TYPE
CETAG	Unique Extension Identifier	6	BLOCKA	n/a	R
CEL	Length of Entire Tagged Record	5	00123	Bytes	R
The following fields define BLOCKA					
BLOCK_INSTANCE	Block number of this image block,	2	01 to 99		R
N_GRAY	No. of gray fill samples	5	00000 to 99999		R
L_LINES	Line count	5	00001 to 99999		R
LAYOVER_ANGLE	SAR: The angle between the first row of pixels and the layover direction in the image; positive values indicate a clockwise direction, defaults to spaces. EO-IR: spaces.	3	000 to 359, spaces	degrees	<R>
SHADOW_ANGLE	SAR: The angle between the first row of pixels and the radar shadow in the image; positive values indicate a clockwise direction, defaults to spaces. EO-IR: spaces.	3	000 to 359, spaces	degrees	<R>
	reserved	16	spaces		R
The following four fields repeat image corner locations described by IGEOLO of the image subheader, but provide higher precision. The format Xddmmss.cc represents degrees (00-89), minutes (00-59), seconds (00-59), and hundredths of seconds (00-99) of latitude, with X = N for north or S for south, and Ydddmmss.cc represents degrees (000-179), minutes (00-59), seconds (00-59), and hundredths of seconds (00-99) of longitude, with Y = E for east or W for west.					
FRLC_LOC	Location of the first row, last column of the image block.	21	Xddmmss.ccYdddmmss.cc		R
LRLC_LOC	Location of the last row, last column of the image block.	21	Xddmmss.ccYdddmmss.cc		R
LRFC_LOC	Location of the last row, first column of the image block.	21	Xddmmss.ccYdddmmss.cc		R
FRFC_LOC	Location of the first row, first column of the image block.	21	Xddmmss.ccYdddmmss.cc		R
	reserved	5	010.0		R

5.2.4. SECTG — Secondary Targeting Information

The format and descriptions for the user defined fields of the SECTGA extension are detailed in Table 6. As many as ten SECTGA extensions can exist in a single NITF file, with the N_SEC field of EXPLTA providing the total count. Either SEC_ID, SEC_BE, or both, must contain a valid identifier.

Table 6. SECTGA — Secondary Targeting Information Extension Format
(TYPE "R" = Required, "C" = Conditional, <> = null data allowed)

FIELD	NAME	SIZE	VALUE RANGE	UNITS	TYPE
CETAG	Unique Extension Identifier	6	SECTGA	n/a	R
CEL	Length of Entire Tagged Record	5	00028	Bytes	R
The following fields define SECTGA					
SEC_ID	Designator of secondary target	12	Alphanumeric		<R>
SEC_BE	Basic Encyclopedia ID of secondary target, including the five character Target Catagory of the expanded BE.	15	Alphanumeric		<R>
	reserved	1	0		R

5.3. BANDS — Multispectral Band Parameters

The BAND extension is defined to replace or supplant information in the NITFS Image Subheader where additional parametric data is required, or where an image contains more than 9 spectral bands. This data extension is placed in each image subheader as required. The format and descriptions of the user defined fields of this are detailed in Table 7.

Table 7. BANDSA — Multispectral Band Parameters Extension Format
(TYPE "R" = Required, "C" = Conditional, <> = null data allowed)

FIELD	NAME	SIZE	VALUE RANGE	UNITS	TYPE
CETAG	Unique Extension Identifier	6	BANDSA	n/a	R
CEL	Length of Entire Tagged Record	5	00029 – 28971	Bytes	R
The Following Fields Define DECIMA					
BANDCOUNT	Number of Bands comprising the image.	4	0001 - 0999	n/a	R
BANDGSD1	Band 1 Ground Sample Distance, the average distance in meters between adjacent pixels for the first band.	5	nn.nn	m	<R>
BANDLBOUND1	Band 1 Lower Wavelength Bound, the wavelength for the first band at the lower 50% (-3db) point of the sensor spectral response.	7	nnnn.nn	µm	R
BANDHBOUND1	Band 1 Upper Wavelength Bound, the wavelength for the first band at the higher 50% (-3db) point of the sensor spectral response.	7	nnnn.nn	µm	R
BANDCALDRK1	Band 1 Calibration (Dark), the calibrated receive power level for the first band that corresponds to a pixel value of 0.	6	nnnn.n	µw/cm^2 sr µm	<R>
BANDCALINC1	Band 1 Calibration (Increment), the mean change in power level for the first band that corresponds to an increase of 1 in pixel value.	4	nn.n	µw/cm^2 sr µm	<R>

BANDGSDn	Band n Ground Sample Distance, the average distance in meters between adjacent pixels for the nth band.	5	nn.nn	m	<C>
BANDLBOUNDn	Band n Lower Wavelength Bound, the wavelength for the nth band at the lower 50% (-3db) point of the sensor spectral response.	7	nnnn.nn	µm	C
BANDHBOUNDn	Band n Upper Wavelength Bound, the wavelength for the nth band at the higher 50% (-3db) point of the sensor spectral response.	7	nnnn.nn	µm	C
BANDCALDRKn	Band n Calibration (Dark), the calibrated receive power level for the nth band that corresponds to a pixel value of 0.	6	nnnn.n	µw/cm^2 sr µm	<C>

BANDCALINCn	Band n Calibration (Increment), the mean change in power level for the nth band that corresponds to an increase of 1 in pixel value.	4	nn.n	µw/cm^2 sr µm	<C>

5.4. EXOPT — Exploitation Usability Optical Information

The Exploitation Usability Optical Information extension is optional. EXOPT provides metadata that allows a user program to determine if the image is suitable for the exploitation problem currently being performed — it contains some of the fields which would make up a NIMA standard directory entry. The format and descriptions for the user defined fields of the EXOPTA are detailed in Table 8. A single EXOPT is placed in the Image Subheader, following AIMID.

Table 8. EXOPTA — Exploitation Usability Optical Information Extension Format
(TYPE "R" = Required, "C" = Conditional, <> = null data allowed)

FIELD	NAME	SIZE	VALUE RANGE	UNITS	TYPE
CETAG	Unique Extension Identifier	6	EXOPTA	n/a	R
CEL	Length data fields	5	00097	Bytes	R
The following fields define EXOPTA					
ANGLE_TO_NORTH	Angle to True North, measured clockwise from first row of the image.	3	000 to 359	degrees	R
MEAN_GSD	Mean Ground Sample Distance. The geometric mean of the cross and along scan center-to-center distance between contiguous ground samples. Accuracy = 10%	5	000.0 to 999.9	inches	R
	reserved	1	1		R
DYNAMIC_RANGE	Dynamic range of pixels in image	5	00000 to 65535		<R>
	reserved	4	spaces		R
	reserved	3	0.0		R
OBL_ANG	Obliquity Angle	5	00.00 to 80.00	degrees	R
ROLL_ANG	Roll Angle	6	±80.00	degrees	<R>
PRIME_ID	Primary Target ID	12	Alphanumeric		<R>
PRIME_BE	Primary Target BE	15	Alphanumeric		<R>
PRIME_ELEVA	Primary Target Elevation Angle	4	00.0 to 90.0	degrees	<R>
	reserved	1	0		R
N_SEC	Number of Secondary Targets in image*	3	000 to 250		R
	reserved	2	spaces		R
	reserved	11	00000010010		R
MAX_LP_SEG	Maximum number of lines per segment, including overlap lines.	5	00001 to 99999		<R>
	reserved	7	0000000		R
NL_LAST_SEG	Number of lines in the last (only) segment, excluding overlap lines.	5	00001 to 99999		<R>

* determines no. of SECTG extensions

5.5. MPDEO — EO-IR Mensuration Data

Mensuration requires the use of precision location vectors. There can be up to 9 precision location vectors, evenly spaced in time. Packaged with each image, in the MPDEO extension below, are the precision location vectors which are required for mensuration within that image. The mensuration process uses the four precision location vectors which occur before the image start time, and the four which follow the image end time. If the imaging time does not span the time of a vector, then only 8 vectors are required (Case 1) If an precision location vector occurs during the imaging time of this image, then a total of 9 vectors are populated in the MPDEO extension (Case 2). If there are only eight in the total set, only populate the first eight in MPDEO. If there are only nine in the total set, then use these. If there are more than nine then start with the fourth precision location vector prior to the (GMT_TIME - SETTLE_TIME) of the image and populate the MPDEOA with nine vectors. There will always be at least eight vectors occurring before and after the (GMT_TIME - SETTLE_TIME) of the image.

The mensuration software will determine whether to use eight or nine precision location vectors.

The format and descriptions for the User Defined fields of the MPDEOA extension are detailed in Table 9.

Table 9. MPDEOA — EO-IR Mensuration Data Extension Format

(TYPE "R" = Required, "C" = Conditional, <> = null data allowed)

FIELD	NAME	SIZE	VALUE RANGE	UNITS	TYPE
CETAG	Unique Extension Identifier	6	MPDEOA	n/a	R
CEL	Length of Entire Tagged Record	5	00346	Bytes	R
The Following Fields Define MPDEOA:					
CONTROL_PT	Control Point Location	11	±12.0000000	inches	R
	reserved	4	FC00		R
LENGTH	Total Number of Lines in imaging operation	5	00001 to 99999		R
START_TIME	UTC of first line of imagery. in the format hhmmss.mmm, where hh is the hour, mm is the minute, ss is the second, and mmm is the millisecond.	10	hhmmss.mmm		R
SETTLE_TIME	Time between start of scan and start of image	6	00.000 to 10.000	seconds	R
AZ_PROJ_OR_SCAN	Azimuth of Array Projection or Azimuth of Scan. Orientation of the optical projection of the -X axis through the control onto the local target plane at scan start time; azimuth is measured from local True North clockwise as viewed from above.	9	000.00000 to 360.00000	degrees	R

FIELD	NAME	SIZE	VALUE RANGE	UNITS	TYPE
AGGR_MODE	Aggregation Mode. The orientation of the optical projection of the -X axis through the control onto the local target plane at scan start time; azimuth is measured from local True North clockwise as viewed from above.	3	1X1, 1X2, 2X2, 2X3, 3X3, 3X4, 4X4, 4X6, 6X6		R
	reserved	1	1		R
SCAN_DIR	Scan Direction. L = Left to Right R = Right to Left	1	L or R		R
SUN_EL	Sun Elevation measured from the target plane at intersection of the optical line of sight with the earth's surface at the time of the first image line.	5	±90.0	degrees	R
SUN AZ	Sun Azimuth measured from true North clockwise (as viewed from above) at the time of the first image line.	5	000.0 to 360.0	degrees	R
	reserved	2	spaces		R
DELTA_E1	UT1 - UTC Valid at time of first image in this window.	4	±800	ms.	R
AlM_X	Initial Aim Point X, Y, & Z components, in Earth Centered Inertial (ECI) coordinate system.	9	±99999999	ft.	R
AIM_Y		9	±99999999	ft.	R
AlM_Z		9	±99999999	ft.	R
TIME_LOCAL_E1	UTC of 1st. Precision Location Vector. Format is HHMMSS.mmm where HH = hours, MM = minutes, SS = seconds, and mmm = milliseconds.	10	HHMMSS.mmm		R
SENSOR_LOC_X1	1st. Precision Location Vector X, Y, & Z components, in Earth Centered Inertial (ECI) coordinate system.	9	±99999999	ft.	R
SENSOR_LOC_Y1		9	±99999999	ft.	R
SENSOR_LOC_Z1		9	±99999999	ft.	R
(through)					
SENSOR_LOC_X8	8th. Precision Location Vector X, Y, & Z components, in Earth Centered Inertial (ECI) coordinate system.	9	±99999999	ft.	R
SENSOR_LOC_Y8		9	±99999999	ft.	R
SENSOR_LOC_Z8		9	±99999999	ft.	R
SENSOR_LOC_X9	9th. Precision Location Vector X, Y, & Z components, in Earth Centered Inertial (ECI) coordinate system.	9	±99999999	ft.	<R>
SENSOR_LOC_Y9		9	±99999999	ft.	<R>
SENSOR_LOC_Z9		9	±99999999	ft.	<R>

5.6. MSTGT — Mission Target Information

MSTGT provides information from the collection plan associated with the image, and should identify specific targets contained within the image (however, due to collection geometry, a referenced target may not actually correspond to the area contained in the image). The format and description of the user defined fields of MSTGTA are given in Table 10. Use of MSTGT is optional. As many as 256 instances of this data extension may occur in each NITF file.

Table 10. MSTGTA — Mission Target Information Extension Format

TYPE "R" = Required, "C" = Conditional, <> = null data allowed)

FIELD	NAME	SIZE	VALUE RANGE	UNITS	TYPE
CETAG	Unique Extension Identifier	6	MSTGTA	n/a	R
CEL	Length of Entire Tagged Record	5	74	Bytes	R
The Following Fields Define MSTGTA					
TGT_NUM	Pre-Planned Target Number. A number assigned to each preplanned target, initialized at 1. Recorded in the mission target support data block and the mission catalog support data block to associate the two groups of information. The same number may be assigned to multiple mission catalog support blocks. Each mission target block shall have a unique number.	3	001 to 999		R
TGT_PRI	Pre-Planned Target Priority: 1 = top priority 2 = second etc.	3	001 to 999		<R>
TGT_REQ	Target Requester. Identification of authority requesting target image.	12	Alphanumeric		<R>
TGT_LDIOV	Latest Date Information of Value This field and TGT_LTIOV together shall contain the date and time (UTC) at which the information contained in the file lses all value and should be discarded. The date is in the format CCYYMMDDhhmmss, where CC is the first two digits of the year (00-99), YY is the last two digits of the year (00-99), MM is the month (01-12), DD is the day (01-31).	9	CCYYMMDD		<R>

FIELD	NAME	SIZE	VALUE RANGE	UNITS	TYPE
TGT_LTIOV	Latest Time Information of Value in the format hhmmZ, where hh is the hour (00-23), and mm is the minute (00-59). UTC (Zulu) is the time zone designator to express the time of day.	5	hhmmZ		<R>
TGT_TYPE	Pre-Planned Target Type: 0 = point 1 = strip 2 = area	1	0 to 9		<R>
TGT_COLL	Pre-Planned Collection Technique: 0 = vertical 1 = forward oblique 2 = right oblique 3 = left oblique 4 = best possible 5-9 = reserved	1	0 to 9		R
TGT_CAT	Target Functional Category Code from DIAM-65-3-1. The five character numeric code classifies the function performed by a facility. The data code is based on an initial breakdown of targets into nine major groups, identifed by the first digit: 1 Raw Materials 2 Basic Processing 3 Basic Equipment Production 4 Basic Services, Research, Utilities 5 End Products (civilian) 6 End Products (military) 7 Places, Population, Govm't 8 Air & Missle Facilities 9 Military Troop Facilities Each successive numeric character, reading from left to right, extends or delineates the definition further.	5	10000 to 99999		<R>
TGT_GMT	GMT at Target. Format is hhmmssZ: HH = Hours, MM = Minutes, SS = Secs.	7	hhmmssZ		R
TGT_ELEV	Target Elevation, MSL. Planned elevation of point target. For strip and area targets, this corresponds to the average elevation of the target area. Measured in feet or meters, as specified by TGT_ELEV_UNIT.	6	-01000 to +30000	feet or meters	R
TGT_ELEV_UNIT	Unit of Target Elevation. f = feet, m=meters.	1	f or m		

FIELD	NAME	SIZE	VALUE RANGE	UNITS	TYPE
TGT_LOC	Target Location. Planned latitude/longitude of corresponding portion of target. The format Xddmmss.ss represents degrees (00-89), minutes (00-59), seconds (00-59), and hundredths of seconds (00-99) of latitude, with X = N for north or S for south, and Yddmmss.ss represents degrees (000-179), minutes (00-59), seconds (00-59), and hundredths of seconds (00-99) of longitude, with Y = E for east or W for west.	21	ddmmss.ssXdddmmss.ssY		R

5.7. RPOS0 — Rapid Positioning Capability

The format and descriptions for the User Defined fields of the RPOS0A extension is detailed in Table 11.

Table 11. RPOS0A — Rapid Positioning Capability Extension Format
(TYPE "R" = Required, "C" = Conditional, "<> = null data allowed)

FIELD	NAME	SIZE	VALUE RANGE	UNITS	TYPE
CETAG	Unique Extension Identifier	6	RPOS0A		R
CEL	Length of Entire Tagged Record	5	01041		R
The following fields define RPOS0A					
	reserved	1	1		R
ERR_BIAS	Error- Bias. 68% non time-varying error estimate, assumes correlated images.	7	0000.00 to 6000.00	meters	R
ERR_RAND	Error - Random	7	0000.00 to 6000.00	meters	R
LINE_OFF	Line Offset	6	000000 to 999999		R
SAMP_OFF	Sample Offset	5	00000 to 99999		R
LAT_OFF	Geodetic Latitude Offset	8	±90.0000	degrees	R
LONG_OFF	Geodetic Longitude Offset	9	±180.0000	degrees	R
HEIGHT_ OFF	Geodetic Height Offset	5	±9000	meters	R
LINE_ SCALE	Line Scale	6	000000 to 999999		R
SAMP_ SCALE	Sample Scale	5	00000 to 99999		R
LAT_ SCALE	Geodetic Latitude Scale	8	±90.0000	degrees	R
LONG_ SCALE	Geodetic Longitude Scale	9	±180.0000	degrees	R
HEIGHT_ SCALE	Geodetic Height Scale	5	±9000	meters	R
LINE_NUM_COEFF_1	20 Line Numerator Coefficients	12	±0.500000E±7		R
(through)					
LINE_NUM_COEFF_20	20 Line Numerator Coefficients	12	±0.500000E±7		R
LINE_DEN_COEFF_1	20 Line Denominator Coefficients	12	±0.500000E±7		R
(through)					
LINE DEN_COEFF_20	20 Line Denominator Coefficients	12	±0.500000E±7		R
SAMP_NUM_COEFF_1	20 Line Numerator Coefficients	12	±0.500000E±7		R
(through)					
SAMP_NUM_COEFF_20	20 Line Numerator Coefficients	12	±0.500000E±7		R
SAMP_DEN_COEFF_1	20 Line Denominator Coefficients	12	±0.500000E±7		R
(through)					
SAMP_DEN_COEFF_20	20 Line Denominator Coefficients	12	±0.500000E±7		R

5.8. SENSR — EO-IR Sensor Parameters

The SENSR provides information about the sensor and its installation. The format and descriptions for the user defined fields of the SENSR extension are detailed in Table 12. A single SENSR is placed in the Image Subheader.

Table 12. SENSRA — EO-IR Sensor Parameters Extension Format

TYPE "R" = Required, "C" = Conditional, <> = null data allowed)

FIELD	NAME	SIZE	VALUE RANGE	UNITS	TYPE
CETAG	Unique Extension Identifier	6	SENSRA	n/a	R
CEL	Length of Entire Tagged Record	5	00103	Bytes	R
The Following Fields Define SENSRA:					
SENSOR_CAT	Sensor Type identifies the type of sensor that produced the image; the first four characters of Sensor Type are expressed as ccff where cc indicates the sensor category: IR = Infrared VH = Visible High Altitude / Long Range VM = Visible Medium Altitude VL = Visible Low Altitude	2	IR, VH, VM, or VL		R
SENSOR_FMT	Sensor Format: FR = Frame LS = Line Scan PB = Pushbroom PS = Pan Scan	2	FR, LS, PB, or PS		
SENSOR_MODEL	Sensor Model Name	6	Alphanumeric		<R>
SENSERIAL	Sensor vendor's serial number of the line replaceable unit (LRU) containing EO-IR imaging electronics involved in creating the imagery contained in this file. Also appears in ACFT.	6	000001 to 999999		<R>
SENSOR_MOUNT	Sensor Mounting Pitch Angle. Angle in degrees between the longitudinal centerline of the platform and the sensor scan axis. Normally only applicable to push broom sensors.	3	±45	degrees	<R>
SENSOR_LOC	Sensor Location. The format Xddmmss.ss represents degrees (00-89), minutes (00-59), seconds (00-59), and hundredths of seconds (00-99) of latitude, with X = N for north or S for south, and Ydddmmss.ss represents degrees (000-179), minutes (00-59), seconds (00-59), and hundredths of seconds (00-99) of longitude, with Y = E for east or W for west.	21	ddmmss.ssXdddmmss.ssY	n/a	R

FIELD	NAME	SIZE	VALUE RANGE	UNITS	TYPE
SENSOR_ALT	Sensor Altitude (above mean sea level - MSL) measured in feet or meters, as specified by SENSOR_ALT.	6	-01000 to +99000	feet or meters	<R>
SENSOR_ALT_UNIT	Unit of Sensor Altitude applies to both SENSOR_ALT and SENSOR_AGL, and may only be null if both altitudes are null. f = feet, m=meters	1	f or m		<R>
SENSOR_AGL	Sensor Radar Altitude measured in feet or meters, as specified by SENSOR_ALT. Filled with spaces when not available, or outside equipment operating range.	5	00010 to 99000	feet or meters	<R>
SENSOR_PITCH	Platform pitch-angle; nose up is positive.	7	±90.00	degrees	<R>
SENSOR_ROLL	Platform roll-angle; right wing up is positive.	7	±180.00	degrees	<R>
SENSOR_YAW	Platform yaw-angle; nose left is positive	7	±180.00	degrees	<R>
PLATFORM_HDG	Heading	5	000.0 to 359.9	degrees	<R>
GROUND_SPD	Ground Speed	6	0000.0 to 9999.9		<R>
GROUND_SPD_UNIT	Unit of Ground Speed. May be null only if GROUND_SPD is null. k=knots, f=feet/sec., m=meters/sec.	1	k, f, or m		<R>
GROUND_TRACK	Ground Track	5	000.0 to 359.9	degrees	<R>
VERT_VEL	Vertical Velocity measured in either feet/min. or meters/min. as specified by VERT_VEL_UNIT.	5	±9999	feet or meters per min	<R>
VERT_VEL_UNIT	Unit of Vertical Velocity. May be null only if VERT_VEL is null. f=feet/min., m=meters/min.	1	f or m		<R>
X_TRACK_SIZE	Number of frames per swath	2	01 to 99		<R>
A_TRACK_SIZE	Number of along track swaths	2	01 to 99		R
SPOT_NUM	Spot Number in point target mode	3	001 to 999		<R>

5.9. STERO — Stereo Information.

The STERO extension provides links between several images that form a stereo set to allow exploitation of elevation information. There can be up to 3 STREO extensions per image. The format and descriptions for the User Defined fields of the STREO extension is detailed in Table 13.

Table 13. STEROA — Stereo Information Extension Format

TYPE "R" = Required, "C" = Conditional, <> = null data allowed)

FIELD	NAME	SIZE	VALUE RANGE	UNITS	TYPE
CETAG	Unique Extension Identifier	6	STEROA	n/a	R
CEL	Length of Entire Tagged Record	5	00074	Bytes	R
The Following Fields Define STEROA:					
ST-ID	Stereo Mate. The 40 character image id of the first stereo mate. The first 24 characters are the first 24 characters of the AIMIDA tag.	40	Alphanumeric		R
N MATES	Number of Stereo Mates. If there are no stereo mates, there will not be any STEROA extensions in the file. If there is a STREOA extension, then there will be at least 1 stereo mate.	1	1 to 3		R
MATE_INSTANCE	Mate Instance identifies which stereo mate is described in that extension. For example, this field contains a 2 for the second stereo mate.	1	1 to 3		R
B_CONV	Beginning Convergence Angle, defined at the first lines of the fore and aft images, unless those images are more than 90 degrees apart; If the images are more than 90 degrees apart, the first line of the fore and the last line of the aft shall be used.	5	00.00 to 90.00	degrees	R
E_CONV	Ending Convergence Angle, defined at the last lines of the fore and aft images, unless those images are more than 90 degrees apart; If the images are more than 90 degrees apart, the last line of the fore and the first line of the aft shall be used.	5	00.00 to 90.00	degrees	R
B_ASYM	Beginning Asymmetry Angle, defined at the first lines of the fore and aft images, unless those images are more than 90 degrees apart; If the images are more than 90 degrees apart, the first line of the fore and the last line of the aft shall be used	5	00.00 to 90.00	degrees	R

FIELD	NAME	SIZE	VALUE RANGE	UNITS	TYPE
E_ASYM	Ending Asymmetry Angle, defined at the last lines of the fore and aft images, unless those images are more than 90 degrees apart; If the images are more than 90 degrees apart, the last line of the fore and the first line of the aft shall be used.	5	00.00 to 90.00	degrees	R
B_BIE	Beginning BIE less Convergence Angle of Stereo Mate, defined at the first lines of the fore and aft images, unless those images are more than 90 degrees apart; If the images are more than 90 degrees apart, the first line of the fore and the last line of the aft shall be used.	6	±90.00	degrees	R
E_EIE	Ending BIE less Convergence Angle of Stereo Mate, defined at the last lines of the fore and aft images, unless those images are more than 90 degrees apart; If the images are more than 90 degrees apart, the last line of the fore and the first line of the aft shall be used.	6	±90.00	degrees	R